

CONTROL OF SPANISH HEATH

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SUMMARY

LARGE areas of low fertility land, particularly in Nelson and northern Marlborough, are either already infested with Spanish heath (*Erica lusitanica*) or are threatened with infestation. If these areas are to be retained for grazing purposes, steps must be taken to raise the level of soil fertility. The alternatives are either reversion to scrub or active afforestation with some species such as *Pinus radiata*.

Extension Division (Department of Agriculture) experimental work aimed at controlling heath in order that farming in the accepted sense may be carried out on a permanent basis is described. Results of this work are reported and some conclusions are drawn.

From time to time during the last 30 years attention has been focused on the spread of Spanish heath, especially in the Wairau Valley and Sounds areas of Marlborough. The plant, which is often associated with tree heath (*E. arborea*) is known to exist from Wellington to the central area of the North Island, probably extending further north, while in the South Island infestations are known in Marlborough, Nelson, North Canterbury, and about Reefton, and there are probably others elsewhere.

DESCRIPTION

Allan (1) describes *E. arborea* as a bushy shrub up to 5 metres tall, sometimes distinctly trunked. The branchlets are hairy with branching hairs, while leaves are about 8 mm. long, dark green in colour and arranged in threes. The flowers are fragrant, paniculately clustered on twigs of the previous year's shoots; the corolla is white to pinkish while the stigmas are flattened and white.

E. lusitanica is described (1) as similar to *E. arborea* but more strictly erect in habit. It has paler leaves, irregularly arranged and about 7 millimetres in length. Branches are plumose, with mainly simple branchlet hairs. Flowers occur in clusters at the end of twigs, the corolla being white to rosy, while the stamens and stigmas are deep pink. The region of origin is south-west Europe.

Spanish heath is unpalatable to stock and concern has been felt at the threat to grazing land which this weed constitutes, but until recently little was done to control it. There were, I believe, two main reasons for the lack of progress in heath control:

- (1) No satisfactory means of killing existing hill country infestations was known.
- (2) The fact that heath is a weed of low fertility soils only was not appreciated.

METHODS OF CONTROL

- (1) **Cultivation:** Where land can be cultivated heath is readily brought under control, and on such country the raising of soil fertility is not normally a serious problem.
- (2) **Afforestation:** Under this heading could come both tree planting and natural reversion to scrub and ultimately to forest. Utilisation of this nature has some merit, but for an area such as the Sounds it

would mean not only the loss of meat and wool production but the elimination of the settlers at present relying on farms for their living.

(3) **Chemical control:** This is a means of killing existing heath plants by the application of herbicides. Because it represents the first step toward replacing a heath cover with a pasture cover, the spraying trials described were conducted.

(4) **Improvement of soil fertility:** I hope to convince those interested in heath control that in soil fertility lies the answer to the problem.

It is then to chemical control and soil fertility improvement that the remainder of this paper is devoted.

Chemical Control

Research into the killing of existing heath was begun in earnest following the advent of hormone-type weedkillers and in November 1947 and March 1948, trials with the ethyl ester of 2,4-D and the sodium salt of MCPA were laid down. The 2,4-D was applied as a spray at 1 lb. acid equivalent per acre, and the MCPA at 1 lb. and 3 lb. acid equivalent per acre as a 1 per cent. dust. Although a kill to ground level was secured, regrowth at the base of all plants soon made its appearance. A second application of the same treatments to one trial gave equally poor results. Subsequent trials illustrated that a complete foliage kill could be secured by the application of any one of a number of herbicides, but great variation occurred in the degree of regrowth which followed their use.

In March 1952 a trial involving the use of butyl and butoxy-ethanol esters of 2,4,5-T and mixed esters of 2,4-D and 2,4,5-T was laid down. The rates of application were 1, 2, and 3 lb. acid equivalent per acre applied in 120 gallons of water. These rates, as applied to the mixed esters, refer to the total of the two ingredients which were present in the proportion of two parts of 2,4-D to 1 part of 2,4,5-T.

The usual foliage kill followed application, but next spring a disappointingly large amount of regrowth appeared from the bases of plants on all 2,4,5-T plots. The regrowth was sprayed in autumn, but even this second application failed to kill all plants, though the number surviving on the 2 lb. and 3 lb. plots was considerably reduced. On the other hand, plots treated with the mixture of 2,4-D and 2,4,5-T gave much better results. A good deal of regrowth appeared on the 1 lb. plot, only a moderate amount on the 2 lb. plot, and little on the 3 lb. one. A single re-treatment cleared the 2 lb. and 3 lb. plots of heath, this being in marked contrast to the pure 2,4,5-T treatments. An identical trial established a year later gave similar results.

The superiority of the mixture over the straight 2,4,5-T suggested that further investigation into the use of 2,4-D might be worth while. Trials were accordingly laid down to test 2,4-D and a number of other materials which had become available since the original 2,4-D trials were established. Materials used included the butyl ester of MCPA, the alkyl cyclo-hexyl ester of 2,4-D, the potassium salt and butyl ester of MCPA, the ethyl ester of 2,4-D, the butoxy ethanol ester of 2,4,5-T, the mixed esters of 2,4-D and 2,4,5-T already mentioned, and the polypropylene glycol butyl ether ester of 2,4,5-T.

Each material was applied at 2 lb. and 4 lb. acid equivalent per acre, one series being applied with water at 125 gallons per acre, while a second series was applied with a similar amount of water plus diesel oil at 10 gallons per acre. Some regrowth appeared on all plots and a year later each was treated with its original material at the rate of 2 lb. acid equivalent per acre, using only diesel oil at 10 gallons per acre as the diluting agent. In all cases the addition of diesel oil gave a greater degree of kill than that obtained on the corresponding plots where water alone was used as the spreader.

Of the materials used the alkyl cyclo-hexyl ester of 2,4-D, the butyl ester of MCPA, the ethyl ester of 2,4-D, and the mixed esters of 2,4-D and 2,4,5-T were the most successful. Even at the lighter rate the butyl ester of MCPA and the ethyl ester of 2,4-D gave satisfactory results. The ethyl ester of 2,4-D thus emerged as the material to be recommended for the killing of heath, while diesel oil as a diluent increases effectiveness. This ester is readily available, relatively low in cost, and gave a kill of heath equal to the best obtained in the trial.

The tip immersion technique was employed in an effort to determine the optimum time of application. Results indicated that treatment during October to March inclusive is most likely to give satisfactory results. All the Departmental trials were laid down during this period, the majority being established in autumn.

Soil Fertility—The Vital Factor

While the trials with herbicides were in progress, sight was not lost of the fact that a low level of soil fertility is the basic reason for the presence of heath on farm land. Pilot oversown and topdressed strips were laid through existing sprayed trials and in autumn 1954 a detailed topdressing and oversowing trial was established in Tuamarina silt loam, the area having been sprayed a month earlier. Fertilisers used included superphosphate, sodium molybdate, and muriate of potash, while lime rates of 5 cwt. and 2 tons per acre (2) were superimposed on the fertiliser treatments. White clover seed at 3 lb. per acre was broadcast over all plots.

Clover seedlings appeared on all plots, but within a few weeks seedlings on certain plots became yellow and died, while those on other plots thrived and soon provided a dense ground cover of vigorous white clover. These results were achieved on a soil of very low fertility and one on which only such species as browntop (*Agrostis tenuis*), gorse (*Ulex europaeus*), *Pinus radiata*, and heath manage to survive.

Despite the fact that marked responses to phosphate and molybdenum in the absence of lime had been secured in some parts of the Sounds area, clover establishment in this trial was nil on plots without lime. However, in the presence of lime at 5 cwt. or more per acre these fertilisers gave outstanding results. In view of the success of the light rate of lime, lower rates ranging from 4 cwt. down to 1 cwt. per acre were added next autumn. The result was that 3 cwt. per acre emerged as the minimum rate at which white clover would establish and grow vigorously. This subject of low rates of lime is being investigated further and one of these trials is described later.

Up to the present all plots on which clover establishment was successful have supported a dense cover of grasses and clover, and most important, during the 4½ years since laying down, no heath has regenerated on these plots. Those on which clover failed to establish had in only 2 years become re-infested to a greater degree than before treatment.

The final trial I shall describe is one where low rates of lime and rhizobium bacterial culture were superimposed on basal phosphate and molybdenum treatments. Bacterial culture enabled white clover to establish and grow reasonably well in the absence of any lime application and quite vigorously in the presence of lime applied at 1 cwt. per acre. This relationship between lime and bacterial culture in clover establishment is the subject of further research work being carried out at the moment.

Plans were laid for the establishment of a project where research results would be applied on a farm scale. Circumstances have caused these plans to be shelved, but let us hope that the project will materialise in the near future.

COSTS

One method of minimising the cost of heath control is to forestall the infestation by improving soil fertility and thus avoiding the need for spraying existing heath. Spraying would normally be necessary only where the density of plants was so great that their shading effect would interfere with the establishment of sown species.

If spraying must be carried out, the cost of material would be about £2 10s. per acre, while its application from the air would cost about £2 per acre.

Without the need for herbicide, heath control becomes synonymous with normal land improvement and the same techniques apply. In other words, if the land is too steep for cultivation, the seed and fertiliser would be applied from the air and the cost would vary with the type and quantities of material required, the location of the property, and so on. Land infested with heath or threatened by it is generally of low fertility and fairly heavy initial fertiliser dressings may be needed. The local Instructor in Agriculture, Department of Agriculture, can provide detailed advice for individual farmers and should be consulted.

With the present uncertain economic outlook the cost of land development may be regarded as high and this is one reason for careful planning. If the job is done block by block, the cost of fencing, which is vital to any land improvement programme, can be spread over several years, grazing can be satisfactorily managed, and increased stock numbers can be progressively reached.

Land improvement schemes require finance and I suggest that the people involved in advancing money for the improvement of heath country should consult an expert in soil fertility before rejecting any scheme as uneconomic.

CONCLUSIONS

Although there are details of soil fertility which call for further research, the stage has been reached where heath can be controlled and, more important, where land free of weed can be protected against infestation. Important steps in control are:

1. It must be realised that heath suppression is incidental to land improvement generally and this fact could well be borne in mind when the Noxious Weed Act is being interpreted. Not only is the spread of troublesome weed halted, but production is increased in the process.
2. Spraying in itself will not eradicate heath which springs up readily from seed. Resort to spraying should only be made when the raising of soil fertility alone is not enough.
3. The fertility requirements of heath infested soils must be determined and the most economical means of correcting deficiencies decided for individual farms. In parts of the Sounds, for instance, the use of large topdressing aircraft may be an advantage.
4. The prejudiced belief that heath country is doomed as a farming proposition should be discouraged.

REFERENCES

1. A handbook of the Naturalised Flora of New Zealand, by H. H. Allan.
2. Lime used was ground limestone containing 80 per cent. Ca CO₃.

DISCUSSION

Comment: 2,4,5-T has been very suitable in Nelson when gorse and Spanish heath have been treated together. No regrowth of heath was noted.

A.—Findings show that a satisfactory kill was obtained with 2 lb.

acid equivalent of the ethyl ester of 2,4-D at an approximate cost of £2 10s. per acre. A poor kill was obtained with 4 lb. acid equivalent of 2,4,5-T which cost approximately £6 per acre.

Q.—Has any work been done on the effect of spraying Spanish heath in mid-winter?

A.—One trial using the tip immersion technique was conducted for all months of the year and indicated that good control was obtained from October through to March inclusive. An emulsifiable ester of 2,4-D was used.

Q.—Can Spanish heath be eradicated by merely improving the fertility of the soil by the use of fertilisers?

A.—Yes, under certain conditions. Spanish heath is fairly susceptible to mechanical damage by stock, so that where adequate subdivision and heavy stocking are possible a good control of small heath would be expected.

Q.—Are plants 8 to 10 ft. high as susceptible to weedicides as smaller plants?

A.—Control would be the same whatever the height, remembering that the taller the plant the greater the difficulty in obtaining an adequate cover.

Q.—Has any large scale aerial spraying of Spanish heath been done in Marlborough?

A.—No, but equally good results could be obtained from the air.

Q.—What rates would be used for aerial application?

A.—2 lb. ester of 2,4-D as oil concentrate in 10 gallons of dieselene per acre.

Q.—What is the viability of seed and potential seed production per plant?

A.—It is known that Spanish heath seeds prolifically, but no definite figures are available.

Q.—What intensity of burn is obtained with green Spanish heath?

A.—The burn is rather unsatisfactory.